REMARKS

Claim 4 is amended to use "first" and "second" only with the CMYK gamuts. Accordingly, the objections to claims 5-6 are met with somewhat different language than indicated in the Official Action. Since claim 16 is canceled, the rejection as indefinite is no longer in issue.

Claims 22 and 23 are based on claims 14 and 15 and are added for a full range of coverage in view of the amendment of claim 11 to independent form.

The term "full CMYK" is supported at page 9, line 10.

As none of the references cited address the improvement achieved by the invention of this application, a general discussion of the invention of this application is provided here before addressing the specific rejections.

This invention addresses the disparity between a theoretically correct cyan, magenta, yellow, black (CMYK) description of an image and the actual image rendered by a printer or other imaging device. A typical printer is constrained by the necessity to print in dots and in dither patterns small enough that the human eye sees a given hue, of a given intensity, and of a given lightness. Also, imaging devices vary from the theoretical in their physical operations and in the materials applied or displayed in images formed.

It is the deficiency from actual results by an imaging device which this invention corrects. Typically, the original image data is in red, green, and blue, (RGB), the additive colors. Converting RGB information to exactly corresponding CMY information is entirely straightforward, and it is not an element of the claims.

An initial conversion from CMY to CMYK is a necessary part of this invention and is claimed. The conversion to CMYK may be by assigning black intensity to that data having CMY at the intensity of the lowest of intensity of the CMY. The CMY data then is assigned its original intensity less that lowest intensity. Such a conversion is known, and the result is theoretically correct. Other conversions which modify this method somewhat are known.

The actual or simulated actual printing from the resulting CMYK data is then determined. One method is to actually print patches using the CMYK data with an

6

imaging device of the type for future use and then to measure the results. These measurements represent actual images. The CIELAB color space for these actual images describes these images by a lightness component and two, orthogonal color components.

That CIELAB color space does not extend to dark tones of the full CMYK gamut. This is illustrated in Figure 2 of the application in which lines 206 and 209 are the bottom of that CIELAB color space and lines 212 and 215 are the bottom of the full CMYK gamut.

The CIELAB color space is then rescaled into a CIELAB color space which includes the omitted dark tones. This modified CIELAB color space is then converted into a CMYK color space.

The advantage of the final CMYK color space is that it employs black. Black inks typically produce a pleasing, dark black appearance. In practical imaging black ink reduces the total ink usage and reduces excessive ink amounts on paper or other substrate. This invention achieves these advantages of black ink used with CMY inks while providing a gamut which is larger than the printing from known conversions from CMY color space to CMYK color space.

Claim 1 is rejected as anticipated by the MacDonald reference. Claim 1 is amended for clarity. With the foregoing discussion in mind, however, it is clear that MacDonald does not create the first CMYK color space as claimed. MacDonald does not mention a black component until the last step. Thus, col. 6, lines 49-54 read: "This CMY image is stored in the store 5 and finally a black printer signal K is generated using a conventional process 26 such as under-color removal following which the full CMYK image is stored in the store 5 for use subsequently to control the printer 7."

Clearly MacDonald has no relevance to creating the lightness-component color space from a CMYK color space as claimed, and so could not teach rescaling the lightness-component color space as claimed.

Claims 7 and 8 are rejected as anticipated by the Holub reference. These claims are canceled by this amendment.

Claim 10 is rejected as anticipated by the Jacob reference. This claim is canceled by this amendment.

7

Claims 2 and 3 are rejected as obvious over MacDonald and farther in view of the Lin reference. As discussed in the foregoing, MacDonald does not teach a transformation from a first CMYK color space as claimed. Lin is to the transformation of an image from one device to the same image for another device by a recalibration transformation. Thus, Lin could not cure the deficiencies of MacDonald as the primary reference relied upon in the rejection.

Claims 4-6 are rejected as unpatentable over the Edge reference and further in view of Lin. Claim 4 is amended somewhat for clarity and accuracy and claims 5 and 6 are amended correspondingly. However, both Edge and Lin are to the transformation of an image from one device to the same image for another device by methods based on the different printing characteristics of the two devices. The claimed first gamut in a CMYK color space is not created and therefore certainly not converted to a second CMYK color space as claimed.

Claim 9 is rejected as obvious over Holub and further in view of MacDonald. This claim is canceled by this amendment.

Claim 11 is rejected as obvious over Jacob and further in view of MacDonald. Claim 11 is now in independent form and is amended somewhat for clarity and accuracy.

Jacob, however, does not transform a CMY space gamut to a CMYK space gamut and then transform the CMYK space gamut to a CIELAB gamut. Jacob begins detailed description of transforms at col. 4, line 11. At col. 4, lines 21-23 Jacob reads: "Next printer CMY values 54 from table 32 are printed and measured on the target color printer 18. The measured values are stored as printer CIE L*a*b* colors 55."

Accordingly, a fundamental element of this invention, transforming CMY to CMYK before conversions to CIELAB, is not taught by Jacob. The rejection cites MacDonald for such a teaching, but, as described in detail in the foregoing with respect to claim 1, MacDonald teaches such a conversion as a final action and thus could not suggest that as an earlier action as claimed.

Moreover, Jacob ultimately obtains from the CIELAB color space gray level values. Gray level values are certainly not a second CMYK color space as claimed.

Claim 12 is rejected as obvious over Jacob and further in view of MacDonald
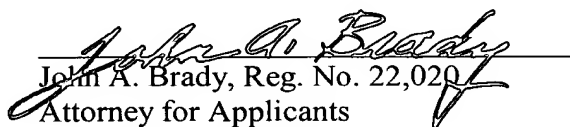
8

and further in view of Holub. Claim 12 is now in independent form and is amended somewhat for clarity and accuracy. Jacob and McDonald are applied essentially as they are applied to claim 11, and the immediately preceding response with respect to claim 11 is incorporated here and so not repeated. No issue is taken with the prior art knowing color conversion of CMYK by mapping to a CIELAB space gamut (for which Holub is cited). Such elements being known in the prior art could not cure the failure of Jacob and MacDonald to suggest the claims as a whole, as discussed in the foregoing with respect to claim 11.

Claims 13-15 and 20-21 are rejected as obvious over Lin and further in view of the Onta reference. Claims 13 and 20-21 are canceled. Claims 14 and 15 are now dependent on claim 12, which is amended. Lin alone is applied to claims 14-15 for compressing the luminance level. However, Lin compresses to bring out-of-gamut colors into the printer gamut. This does not suggest expanding a gamut to the bottom of another gamut.

Claims 16-19 are rejected as obvious over Onta and further in view of Lin. Claims 16-19 canceled.

Accordingly, reconsideration is respectfully requested, followed by allowance of claims 1-6, 11, 12, 14, 15, 22 and 23.

Respectfully submitted,
Tomasz J. Cholewo et al.

John A. Brady, Reg. No. 22,020
Attorney for Applicants
Lexmark International, Inc.
Intellectual Property Law Dept.
740 West New Circle Road
Lexington, KY 40550
(859) 232-4785

9

LE9-99-144
09/489,226